UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/672,282	09/25/2003	Mary Lou Guerinot	DCI-111	8165

959 7590 08/28/2006

LAHIVE & COCKFIELD
28 STATE STREET
BOSTON, MA 02109

EXAMINER	
IBRAHIM, MEDINA AHMED	
ART UNIT	**PAPER NUMBER**
1638	

DATE MAILED: 08/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/672,282	GUERINOT ET AL.	
	Examiner	Art Unit	
	Medina A. Ibrahim	1638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) *1-6,10,15 and 20-25* is/are withdrawn from consideration.

5)☒ Claim(s) *7* is/are allowed.

6)☒ Claim(s) *11-14,16-19 and 26* is/are rejected.

7)☒ Claim(s) *8 and 9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Group II, clams 7-9, 11-14, 16-19, 26, and SEQ ID NO: 3 in the reply filed on 06/14/06 is acknowledged. Claim 15, newly assigned as Group III, was inadvertently included in Group II. Claim 15, drawn to a composition comprising a transgenic plant or portion thereof and a pharmaceutical acceptable carrier, defines an invention that is patentably distinct from invention I and II. Inventions II and III are related as mutually exclusive species in an intermediate-final product relationship. Distinctness is proven for claims in this relationship if the intermediate product is useful to make other than the final product (MPEP § 806.04(b), 3rd paragraph), and the species are patentably distinct (MPEP § 806.04(h)). In the instant case, the intermediate product is deemed to be useful as a parent plant in plant breeding processes; and the inventions are deemed patentably distinct since there is nothing on this record to show them to be obvious variants. Furthermore, searching inventions II with invention III, would impose serious search burden, since the search required for one group is not required for another.

Applicant argues against the restriction requirement between SEQ ID NO: 3, 6, and 9 because Applicant submits that the sequences are highly homologous and that they are all induced by iron deficiency conditions. Therefore, Applicant asserts that the coexamination of SEQ ID NO: 3, 6, and 9 would not present serious search burden. These arguments are considered and found persuasive, since the sequences are all from a single plant species encoding polypeptides of similar function. Therefore, SEQ ID

NO: 3, 6 and 9 are hereby considered together.

Claims 1-26 are pending.

Claims 1-6, 10, 15, and 20-25 are withdrawn from consideration as being directed to the non-elected invention.

Claims 7-9, 11-14, 16-19, and 26 are examined.

Claim Objections

At claim 7, it is suggested that "FRD3" be replaced with ---ferric reductase defective (FRD3), for clarification.

Claim 8 is objected to because it does not further limit parent claim 7. SEQ ID NO: 3, 6, and 9 could only be produced by recombinant or synthetic means.

Claim 9 is objected to because it does not further limit parent claim 7. SEQ ID NO: 3, 6, and 9 does not further comprise a heterologous sequence. Clarification and/or correction are required.

Claims 12-13 are objected to for reciting a non-elected invention.

Specification

The disclosure is objected to because of the following informalities: for example, page 1, line 19; and page 55, lines 28-29; page 57, lines 22 and 29; page 58, lines 4-9; of the specification contain an embedded hyperlink directed to an Internet address. The use of hyperlinks and/or other form of browser- executable code are not permitted under USPTO current policy because the content of such links are subject to a change, resulting in the introduction of New Matter into the specification. Applicant is required to check the specification and delete for embedded hyperlink and/or other form of browser-

executable code for hyperlinks. See MPEP 608.01.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 11-14, 16-19, and 26 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the isolated polypeptides of SEQ ID NO: 3, 6, and 9, transgenic plant comprising it and a method of using said plant to remove metal contaminants, does not reasonably provide enablement for a transgenic plant comprising a portion of SEQ ID NO: 3, 6, or 9 and polymorphic variants thereof having FRD3 activity. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims.

The claims are broadly drawn to a transgenic plant comprising an isolated FRD3 polypeptide or portion thereof, or a polymorphic variant of SEQ ID NO: 3, 6, or 9 having FRD3-mediated activity, and a method of using said polypeptide and transgenic plant to promote plant growth and remove metal contaminants, respectively.

Applicant provides guidance for the identification and cloning of three nucleic acids designated "frd3" from Arabidopsis encoding a ferric reductase defective polypeptide. Applicant also teaches that Arabidopsis mutants carrying all three frd3 alleles show concentration of iron, zinc and manganese in their shoots that is at least twice of that in the wild-type. Applicant further teaches that the expression of frd3

polypeptide is induced by both iron deficiency and normal iron conditions. Applicant teaches that the isolated ferric reductase defective polypeptide is a subset of the multidrug and toxin efflux family protein which functions as a transporter of small organic molecules and is a receptor of iron deficient molecule and functions as a modulator of metal concentration. (Examples 1 and 2; Figures 8-9 and 11).

Applicant, however, does not teach or provide guidance for the broad scope of the frd3 polypeptides encompassing portions of the disclosed polypeptides and polymorphic variants thereof having the frd3 biological activity. Applicant has not provided guidance for which portions of the disclosed polypeptides of SEQ ID NO: 3, 6, and 9 are sufficient to provide frd3 biological function upon expression in a transgenic plant, or capable of modulating metal concentration or transporting of metals from a contaminated medium. Applicant has not disclosed a transgenic plant capable of a phytoremediation or a transgenic plant with improved growth characteristics as a result of expressing exemplified or non-exemplified frd3 polypeptide. Applicant has not provided guidance for the removal of metals/contaminants from biological samples other than plant growth medium using transgenic plants expressing exemplified or non-exemplified sequences.

Applicant has not provided guidance for any modifications to SEQ ID NO: 3, 6 or 9 that resulted in a polymorphic variant or functional portion retaining the biological function of an frd3 polypeptide. Applicant has not taught regions in the full-length sequence of SEQ ID NO: 3, 6, and 9 that would tolerate multiple amino acid deletions, additions or substitutions. While recombinant and mutagenesis techniques are known,

it is not routine in the art to screen for multiple substitutions, additions and deletions, as encompassed by the instant claims, and the regions within the a proteins' sequence where amino acid mutations can be made with a reasonable expectation of success in obtaining the desired function are limited in any protein and the results of such mutations are unpredictable.

Since the amino acid sequence of a protein determines its structural and functional properties, predictability of which changes can be tolerated in a protein's amino acid sequence and obtain the desired activity requires substantial guidance with respect to which amino acids in the protein's sequence, if any, would tolerate to modification, and detailed knowledge of the ways in which protein's structure relates to its function. In addition, making "conservative" substitutions does not usually produce predictable results. See, for example Lazar et al (Mol. Cell. Biol., Vol. 8, pp. 1247-1252, 1988(U)) who teach that the conservative substitution of glutamic acid for aspartic acid at position 47 reduced biological function of transforming growth factor alpha, while "nonconservative" substitutions with alanine or asparagine had no effect (see at least the Abstract). In the absence of such guidance, one skilled in the art would have to proceed with undue trial and error experimentation to screen through a vast number of polypeptides with multiple amino acid modifications to identify those having the functional activity of SEQ ID NO: 1 and 3.

Therefore, given the breadth of the claims; the lack of guidance as discussed supra; the unpredictability with regard to amino acid modifications; and the limited working examples, the claimed invention is not enabled throughout the broad scope.

See, *In re Wands* (*858F.2d 731, 8 USPQ2d 1400 (Fed. Cir. 1988)*. See also, *Amgen Inc. Chugai Pharmaceutical Co. Ltd.*, 18 USPQ 2d 1016 at 1027 (Fed. Cir. 1991) where the court held that the disclosure of a few gene sequences did not enable claims broadly drawn to any analog thereof.

Written Description

Claims 11-14, 16-19, and 26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicant broadly claims a transgenic plant expressing an frd3 polypeptide or a portion thereof having FRD3-mediated activity or polymorphic variants of SEQ ID NO: 3, 6, or 9. In contrast, Applicant describes transgenic plants expressing SEQ ID NO: 3, 6 or 9. These are genus claims.

The claimed invention does not meet the written description requirement because Applicant has not described a representative number of polypeptides of the claimed genus of frd3 polypeptides including genus of portions, polymorphic variants and alleles of SEQ ID NO: 3, 6, and 9. Nor that Applicant describes structural features common to all FRD3 polypeptides having metal chelating activity or capable of regulating iron concentration, which would allow one skilled in the art to predictably determine what will be the identity/structure of the members of the genus. Applicant has not described a single variant having both the structural and functional characteristics

as recited in the claims. Therefore, the disclosed sequences of SEQ ID NO: 3, 6, and 9 are not a representative number of the genus of the polypeptides as broadly claimed. Since Applicant has not described the polypeptides as broadly claimed, transgenic plants and methods that employ said polypeptides or said transgenic plant are similarly not described. Therefore, given this lack of description of representative species encompassed by the genus of the claims, the specification fails to sufficiently describe the claimed invention in such full, clear, concise, and exact terms that a skilled artisan would recognize that Applicant was in possession of the invention as broadly claimed at the time of filing.

See, the *University of California v. Eli Lilly and Co.* 43 USPQ2d 1398 (Fed. Cir. 1997) states "A description of a genus of cDNA may be achieved by means of a recitation of a representative number of cDNAs, defined by nucleotide sequence, falling within the scope of the genus or of a recitation of structural features common to members of the genus, which features constitute a substantial portion of the genus. See also where the court teaches that the disclosure of a process for obtaining cDNA from a particular organism and the description of the encoded protein fail to provide an adequate written description of the actual cDNA from the organism which would encode the protein from that organism, despite the disclosure of a cDNA encoding that protein from another organism.

Therefore, weighing all factors above, the claimed invention does not meet the current written description requirements. See, also Written description Examination

Guidelines published in Federal Registry/Vol. 66, No.4/Friday, January 5, 2001/Notices).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 11-14, 16-19 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Guerinot et al (US 5, 846, 821, Applicant's IDS).

The claims are drawn to a transgenic plant expressing an frd3 polypeptide including a portion, a polymorphic variant or an allelic variant of SEQ ID NO: 3, 6 or 9, capable of regulating metal regulating activity; a method of producing said plant, and a method using the plant to remove metals.

Guerinot et al teach transgenic plants expressing iron regulator polypeptide designated as 'IRT" from Arabidopsis, and method of overexpressing said polypeptide to increase uptake of iron, thereby increasing the concentration of iron in an iron deficient plant. The cited reference also teaches method of using said transgenic plants to remove metals including Cd, Co, Mn, and Pb and/or Zn. The cited reference also teaches that the transgenic plants include rice, beans, peas and maize (see at least columns 22-23, and Examples 1-9). Given the broad scope and the vast number of undescribed iron regulated polypeptides encompassed by the claims, the claimed transgenic plants expressing undescribed frd3 polypeptide including a portion, a

polymorphic variant or an allelic variant of SEQ ID NO: 3, 6 or 9, are identical to those of the prior art, absent evidence to the contrary. Note, the claims do not recite a structural property that would distinguish the "portion", "polymorphic variant" or "allelic variant" of SEQ ID NO: 3, 6 or 9 from the IRT polypeptide, also from Arabidopsis, of the prior art. Therefore, Guerinot et al teach all claim limitations.

Remarks

Claims 7-9 are free of the prior art of record.

Claim 7 would be allowable

No claim is allowed.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Medina A. Ibrahim whose telephone number is (571) 272-0797. The Examiner can normally be reached Monday -Thursday from 8:00AM to 5:30PM and every other Friday from 9:00AM to 5:00 PM. Before and after final responses should be directed to fax nos. (703) 872-9306 and (703) 872-9307, respectively.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Anne Marie Grunberg, can be reached at (571) 272-0795.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

8/21/06
Mai

MEDINA A. IBRAHIM
PRIMARY EXAMINER